

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Pingali *et al.*

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Art Unit: 2851

Examiner: Sever, Andrew T.

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Title: A System and Method for Positioning Projectors in Space to Steer Projections and Afford Interaction

REPLY BRIEF

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Commissioner for Patents
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Sir:

This is in reply to the Examiner's Answer mailed January 29, 2007.

Issue A

Argument 1

The Examiner has replied to Appellants' arguments by adopting both unreasonable positions regarding claim construction and fanciful interpretations of the relied-upon references. In addition, the Examiner has failed to respond to Appellants' argument that combining the teaching of Miyamoto with Raskar and Connelly would

render Miyamoto unsatisfactory for its intended purpose. The unanswered arguments of Appellants should in and of themselves resolve this Appeal in Appellants' favor.

Argument 1 of Appellants is comprised of two sub-arguments. The first sub-argument concerned the fact that Miyamoto does not disclose projection of a distorted image. Appellants' invention as recited in claim 1 is directed to a system incorporating a projection unit comprising at least a "projector for projecting a distorted image" and "a mechanism for providing translational movement and rotational movement for adjusting one of a position and an orientation of the projection unit to produce from the distorted image a substantially undistorted image on a surface."

This aspect of Appellants' invention is described in the application at page 8, line 23 – page 9, line 5 and page 9, line 27 – page 10, line 2 as follows:

"For convenience, it is generally considered that the projection unit 5 includes the projector 3 and a display controller 20. The display controller 20 provides for generation of a distorted image 16. The distorted image 16 is provided to the projector 3 for projection ...

* * *

It is not required that the projection unit 5 has the camera, or other complimentary equipment. Rather, it is preferred that the projection unit 5 be equipped to produce the distorted image 16. Preferably, the distorted image 11 is distorted ('pre-warped' or otherwise adjusted) to appear with adequate quality substantially undistorted on surfaces 12, such as those positioned at oblique angles from the position unit 5. Preferably, the positioning system 50 is configured so to steer the distorted image 16 to provide appropriate quality adjustments which produce the substantially undistorted image."

Appellants do not seek to incorporate this subject matter into the claims. Appellants merely provide this explanation as background to aid in the understanding of the claims.

Accordingly, in one aspect of Appellants' invention a distorted image is projected by a projector, and movement of the projector is used to correct the distortion so that an undistorted image appears on a surface. In responding to Appellant's arguments at page 14, line 18 – page 16, line 5 Examiner argues (emphasis added):

“Claim one reads in part ‘the projection unit comprised of at least a projector for projecting a distorted image’. It is clear from figure 1 of Miyamoto that a projection unit (11) is provided that projects an image ... which produces an image ... on the side of floating object (1).

While from inspection it appears that the image produce [sic] on the object is in fact distorted ... thus meeting the claim limitation, Miyamoto does not literally or specifically teach that it is distorted, however, Raskar et al. teaches in column 1 line 67 through column 2 line 9 that anytime a projector projects on a large curved object which would include the object of Miyamoto, unless the projector is at the so-called ‘sweet spot’ (column 2 line 8), the image when viewed by viewers will inherently be viewed as distorted. Accordingly one of ordinary skill in the art at the time the invention was made would have recognized that absent any teaching of a correction device (such as that taught elsewhere in Raskar) or a specific teaching that the projector is maintained at the ‘sweet-spot’ the image projected by the projection unit (11) of Miyamoto would be distorted thus meeting the limitation of claim 1.”

The supposed distortion relied upon by the Examiner in Miyamoto results from the interaction of the image with the display surface. The Examiner admits as much when he states “the image produce [sic] on the object is distorted.” Claim 1, however, does not

concern production of distorted image on a surface. Quite the contrary; claim 1 concerns correcting the appearance of a projected distorted image on a surface “to produce a substantially undistorted image” “by adjusting one of a position and an orientation of the projection unit.” In reading these limitations to encompass distortion that results from the interaction of a projected image with a surface, the Examiner has adopted an unreasonable construction for claim 1, and essentially turned the issues on their head.

In arguing against the propriety of the rejection relied upon by the Examiner in Appellants’ second sub-argument, Appellant advanced that such a combination would render the primary reference unsuitable for its intended purpose. This is one way of determining whether there is a suggestion to combine the references. If a modification required by a combination would render the subject matter of the primary reference unsuitable for its intended purpose, there cannot be said to be a suggestion to combine the references. This is a practical, common-sense approach to analyzing a combination made by an Examiner, and eliminates as improper a combination selected in a grocery-list manner that ignores the fact that the combination, when considered as a whole, would not make sense from the perspective of one of ordinary skill seeking to modify the primary reference.

The Miyamoto reference has an infrared image pick-up unit for tracking the position of an airship. In other words, Miyamoto requires real-time updates of the position of the blimp since it is not known, in advance, where the exact position of the blimp may be. This is the only teaching of Miyamoto – a tracking device that enables an

image to be projected on a moving object. The Miyamoto reference does not teach distorting an image in such a way so that when it is displayed it appears undistorted. The only reference in the primary combination relied upon by the Examiner concerning distortion of an image is Raskar. Connelly, as will be detailed below, does not concern distortion of an image. Accordingly, the Examiner's attempt to credit the teaching of Raskar to Miyamoto is simply a transparent attempt to avoid teachings of Raskar that do not support the Examiner's arguments. The Examiner even goes so far as to admit as much when he states as page 16, lines 7 – 12 that:

“While the Raskar reference is used later in the rejection to specifically teach a method of projecting using multiple projectors and a distortion correction method when doing so, it is not used to teach producing the substantially undistorted image on the surface. It is only produced to show evidence that one of ordinary skill in the art would recognize the image projected by the projecting unit (11) on a curved object would be distorted.”

With this flourish the Examiner concludes that he can ignore the inconvenient teachings of Raskar, even though he admits in the same sentence he will later rely on them.

If the Examiner admits that it is necessary to rely on the remaining portions of Raskar for Examiner's arguments, than he should have to answer Appellants' arguments regarding the fact that combining Raskar with Miyamoto would render Miyamoto unsuitable for its intended purpose. The Miyamoto reference is concerned with projecting an image on an airship as the airship moves. Raskar (assuming it could be practically combined with Miyamoto which Appellants admit only for the sake of

argument) requires calibration steps to be performed. These calibration steps would require almost continual projection of a calibration image as the airship bobs in the wind. The interruption necessitated by the calibration steps of Raskar would render Miyamoto unsatisfactory for its intended purpose since the calibration steps would interrupt the display of the image that the users of Miyamoto actually wish to display.

Appellants respectfully submit that combining the teachings of Miyamoto with Connelly would also render Miyamoto unsuitable for its intended purpose. As detailed below in Argument 2, Appellants believe that the combination of Miyamoto with Connelly in the manner of the Examiner is contradictory and illogical because Connelly teaches to always place a projector in a single sweet spot so that an undistorted image can be projected so as to create an undistorted image. This means that a distorted image is not projected, so there is no need to move the projection apparatus to correct for distortion. Nonetheless, assuming only for the sake of argument that the teachings of Miyamoto and Connelly can be combined, it is not seen how Miyamoto's image can be continually displayed in a system incorporating apparatus operating according to Connelly's teachings. One of ordinary skill in the art would recognize that due to atmospheric conditions it may be impossible to move the projection apparatus to the so-called sweet spot. Since Connelly teaches to project an image only from the sweet spot, the inability to move the projector to the sweet spot would seem to interrupt the desired continual projection operations in many instances.

Since the Examiner never responded to this second sub-argument, this omission should in and of itself result in deciding the instant Appeal in Appellants' favor.

Accordingly, Appellants respectfully request that the rejection of claims 1, 24, 30, 31, 32, 34, 35, 37 and 40, relying on an impermissible combination of the teachings of Miyamoto, Raskar and Connolly, be withdrawn. As all of the dependent claims 2 – 3, 5, 6, 15 – 23, 25 – 29, 36 and 38 – 39 depend either directly or indirectly from these claims, their rejections must likewise be withdrawn.

Argument 2

Claim 1 recites “providing translational movement and rotational movement for adjusting one of a position and orientation of the projection unit to produce from the distorted image a substantially undistorted image on a surface.” Appellants argued that none of the references teach providing the “translational movement and rotational movement” to cure the distortion of the image and thereby produce from the distorted image a substantially undistorted image on the surface. The Examiner again decided not to reply to the substance of Appellants’ arguments and instead argued that the Appellants were incorrectly contesting a rejection by attacking references individually. Appellants did not incorrectly seek to contest a rejection by attacking references individually; rather, Appellants argued that the teachings of the references have been mischaracterized. Accordingly, the resulting combination is faulty and is not a proper basis for rejection. Since Appellants believe the teachings of the references, particularly the Connolly reference, have been mischaracterized, the Examiner’s failure to respond to the substance

of Appellant's Argument 2 should in and of itself resolve this aspect of the Appeal in Appellants' favor.

Regarding the Examiner's mischaracterization of the references, Connelly is concerned with a different problem from Appellants' invention. In some image projection situations of concern to Connelly multiple projectors are used, for example, to alternately create images on the same area of a display. Due to the impracticality of moving heavy projectors during projection operations, the projectors are conventionally toed-in, meaning that they are not positioned along the centerline of the display. Such positioning of the projectors results in keystone distortion, whereby one side of a displayed image is higher than the other side.

Connelly attempts to solve this problem by providing a relatively simple solution that totally avoids creating a projected image that requires distortion correction. In Connelly's apparatus, projectors are mounted on rails and moved back and forth between storage positions and a projection position. In such an arrangement, the projectors need not be toed-in with respect to the axis of the display and can share the sweet spot (although not simultaneously), and no distorted image need be projected.

It cannot be said that the movement of the projectors from a storage position to the projection position is performed to correct distortion. The projectors when positioned at the storage position are not toed in, nor are they arranged to project anything. It is only in the single projection position that the projectors project anything.

Once in the projection position, they are not moved during projection operations. In fact, the most accurate way to describe the teachings of Connelly is that they avoid the need for distortion correction by alternately switching individual projectors of a bank of projectors into a so-called “sweet spot” where distortion is not an issue. Once in the sweet spot, there is no suggestion that the moving rails can be used to correct any residual distortion. In other words, the teachings of Connelly seek to avoid the need for correcting distortion by moving projectors to a position where it is known that distortion will not be an issue. This is totally different from Appellants’ invention as claimed which seeks to display an undistorted image by projecting a distorted image and adjusting the positioning of the projector so that the undistorted image results.

Accordingly, it is incorrect to characterize Connelly as teaching anything with respect to creating an undistorted image by initially projecting a distorted image and then by moving the projector in such a way so that the distortion is corrected for and the image appears undistorted. Notwithstanding this observation, the Examiner discusses Connelly as if it does, and alternates between a relatively precise expression of Connelly’s teaching, and broad expressions not supported by Connelly. Contrast the supposed statement of Connelly’s teachings at the bottom of page 18; top of page 20; and the top of page 21 of Examiner’s Answer with the statement appearing at page 19, lines 5 – 13. The broad statements appearing on pages 18, 20 and 21 do not follow from the more accurate statement appearing on page 19.

With these observations in mind, it can be concluded that none of the references of record teach “providing translational movement and rotational movement for adjusting one of a position and an orientation of the projection unit to produce from the distorted image a substantially undistorted image on a surface.” The only relied-upon reference that concerns rotational movement – Miyamoto – does not suggest that such rotational movement can be used to correct distortion. The only relied-upon reference that concerns translational movement – Connnelly – similarly does not suggest that translational movement can be used to correct distortion.

If there is any lingering doubt about the correctness of Appellants’ arguments, it is confirmed by the Examiner at page 22, lines 16 - 19 when replying to Appellants’ Argument 3 where he unwittingly states:

“One of ordinary skill in the art at the time the invention was made as was taught by both Raskar and Connnelly would recognize that unless the projector was carefully aligned with the ‘sweet spot’ or ‘centerline’ of any screen especially curved ones, would naturally project a distorted image.”

Even the Examiner admits that Connnelly is seeking to avoid distortion by placing the projector in a position where distortion does not occur. The movement to this position from a storage position cannot then be said to be for the purpose of distortion correction.

For this reason alone, rejection of claim 1 must be withdrawn. As claims 24, 30, 35 and 37 recite similar subject matter, the rejection of these claims must likewise be withdrawn.

Argument 3

The Examiner states the following when replying to Appellants' Argument 3 at page 23, lines 8 – 12:

“Appellant argued that Miyamoto is directed to a projection system that projects on a moving surface, while Raskar's method is for projecting on a stationary surface, that modifying Miyamoto as taught by Raskar would render Miyamoto inoperative as it would require the surface to be stationary at least long enough for Raskar's calibration method”.

This is only an aspect of Appellants' argument regarding the combination of Miyamoto and Raskar rendering Miyamoto unsuitable for its intended purpose and mischaracterizes it. Miyamoto's primary aim is to be able to continually display an image on an airship. The need to project a calibration image almost continually to correct for distortion as the airship bobs in the breeze would prevent Miyamoto from continually projecting the desired image, thus rendering Miyamoto unsuitable for its intended purpose.

The Examiner also argues at page 23, lines 12 - 20 that:

“Appellant's argument at least with regard to claims 1 – 3, 5, 6, 15 – 29, 32 and 34 – 40 are moot as it is irrelevant how Raskar corrects for such distortions. While Raskar does teach its own digital method for correcting for distortions, the specific method is not applicable to claims 1 – 3, 5, 6, 15 – 29, 32 and 34 – 40 as the method is a digital method that is applicable for multiple tiled projector [sic] and the resulting substantially undistorted image is not the result of adjusting one of a position and an orientation of a position and an orientation of the projection unit, such a method is taught by Connelly et al.”

The Examiner is incorrect because as set forth above Connelly does not concern “projecting a distorted image” and “producing from the distorted image a substantially undistorted image using a mechanism for providing translational … movement for adjusting one of a position and an orientation of the projection unit.”

In addition, since the Examiner apparently admits in this portion of the Examiner’s Answer that the specific distortion correction teachings of Raskar are not relevant to Appellants’ invention, the Examiner has not set forth a *prima facie* case of obviousness since the references of record combined in the manner of the Examiner neither describe nor suggest either “projecting a distorted image” or a “mechanism for providing translational movement and rotational movement for adjusting one of a position and an orientation of the projection unit to produce from the distorted image a substantially undistorted image on a surface.” Thus, each and every limitation of the claims at issue is not taught by the relied-upon combination.

For this reason alone, rejection of claim 1 must be withdrawn. Since claims 24, 30, 31, 35 and 37 recite similar subject matter, their rejection must be withdrawn as well.

Argument 4

As set forth previously, the Examiner improperly relies on a distortion that results from an image being displayed on a curved surface to meet the limitation of claim 1 having to do with “projecting a distorted image”. An image that is undistorted when projected can become distorted in such a situation through interaction with the display

surface. Appellants, alternatively, project a distorted image that appears undistorted when properly positioned on the display surface through adjustment of the projector unit. In this regard, Examiner's statement that one skilled in the art would recognize that Miyamoto inherently discloses a controller for generating a distorted image is illogical, because the distortion relied upon by the Examiner is not present when the image is projected, but rather only occurs when the image is displayed on a surface that distorts the image.

Additionally, Examiner should not be heard to argue that the combination of Miyamoto with Raskar would teach this limitation. As Examiner has stated in Examiner's Answer, Raskar is not relied on to teach a specific manner of correcting image distortion.

For this reason Appellants respectfully submit that the rejection of claims 5 and 6 on this basis should be withdrawn.

Argument 5

As set forth previously, the tracking and position adjustment operations of Miyamoto are irrelevant to the claims at hand because none of the references either describe or suggest using position adjustment to correct distortion in a projected distorted image when the image is displayed on a surface. To repeat, Miyamoto only teaches means for projecting an image on a moving airship. There is no recognition in Miyamoto or any of the references of record that positioning apparatus like that disclosed in

Miyamoto can be used to correct image distortion so that a projected distorted image appears undistorted on a display surface. Since the claim limitations at issue have to do with positioning a projector unit wherein the positioning, at least in part, seeks to correct for image distortion it is not seen where the relied-upon teachings of Miyamoto or any of the other references of record either describe or suggest the subject matter of claims 18 or 40.

For this reason alone the rejection of claims 18 and 40 should be withdrawn.

Argument 6

Appellant observes that the Examiner is now relying on the combination Raskar and Miyamoto apparently to perform image correction, rather than merely to understand that an image projected in a system like that disclosed in Miyamoto would become distorted through interaction with a display surface. Examiner has repeatedly stated that Raskar is not relied upon for such teaching. In fact, Examiner admits that Raskar does not operate in this manner (See, for example, the portion of Examiner's Answer appearing at page 23, lines 16 – 20).

Appellants also repeat that there is no teaching in the primary combination of references relied upon by the Examiner indicating that correcting for distortion present in a projected image can be accomplished by adjusting the position and orientation of the projection unit. Accordingly, the relied-upon references are not seen to disclose the

subject matter of claims that have to do in any way with correcting a projected distorted image by adjustment of the position and orientation of the projection unit.

For this reason alone the rejection of claim 31 should be withdrawn.

Argument 7

Regarding claim 32, one skilled in the art would understand that claim 32 is directed, at least in part, to apparatus capable of moving the projection unit to predetermined positions where projection may occur. This evidenced by the use or the term “layout” in the claim which would be understood by one skilled in the art in the context of the description to refer to a specification of positions where the projector unit will be moved to perform projection operations. After all, this is an important aspect of Appellants’ invention. None of the art of record either describe or suggest such predetermined modes of operation. Miyamoto does not operate in this manner as evidenced by the position tracking system – it is not known where the airship in Miyamoto will be at any particular point in time so a position tracking system is required. Raskar neither describes nor suggests this subject matter since Raskar operates in a situations where projectors are pre-positioned and not moved between positions where display operations may occur. Finally, Connelly positively teaches away from such a mode of operation because projection operations only occur from a single point regardless of which projector is used.

For this reason alone the rejection of claim 32 should be withdrawn.

Argument 8

Regarding claim 34, Appellants respectfully refer to the arguments presented above. The position tracking system and projection unit turntable Of Miyamoto are used to project an image at a predetermined position on an airship. There is no recognition in Miyamoto or any of the other art of record that positioning apparatus associated with a projection unit can be used to correct image distortion so that a projected distorted image appears undistorted on a surface.

For this reason the rejection of claim 34 should be withdrawn.

Issue B

Argument 1

The arguments presented above with respect to Issue A, Argument 7 (claim 32) are similarly applicable here. Appellants respectfully submit that as a result claim 33 is similarly allowable. Appellants therefore respectfully request that the rejection of claim 33 be reversed as well.

Conclusion

For at least the above reasons, the Appellants contend that all of the independent claims 1, 24, 30 – 35, 37 and 40 are patentable over any of the art of record, whether taken singly or in combination so Appellants request that the rejection of these claims be withdrawn. As all of claims 2 – 13, 15 – 23, 25 – 29, 36 and 38 – 39 are dependent upon claims 1, 24, 35 and 37, they are likewise patentable for at least this reason and the rejection of these claims should likewise be withdrawn. The Appellants respectfully request that the Board reverse the final rejection of the claims in the Office Action of December 29, 2006, and further that the Board rule that the pending claims are patentable over the cited art.

Respectfully submitted,

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Date

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